APPLICATION

The various protective functions of the MRDT4 are specifically tailored to the protection of two winding transformers. The device offers in addition to the differential protection various communication and backup protection functions. Furthermore the MRDT4 can be used for generator differential protection. The protection functions of the MRDT4 have been adapted to comply with the requirements of the VDE-AR-N-4110:2018.

ALL INCLUSIVE:

- All protection features without extra charge
- Parameter setting and evaluation software
- Disturbance record analysis software

TRANSFORMER PHASE DIFFERENTIAL PROTECTION

- Stabilized phase differential protection with transients and C.T. saturation detection
- Various selectable transformer groups
- Zero sequence removal
- Three point slope characteristic
- High set element (non-restraint)

TWO ELEMENTS GROUND DIFFERENTIAL PROTECTION

- Three point slope characteristic
- High set element (non-restraint)
- Wattmetric Ground Fault Protection

BACKUP PROTECTION

- 4 Elements Overcurrent/short-circuit protection (non-directional)
- 4 Elements Earth fault protection (non-directional)
- Tripping characteristics: DEFT
  ANSI: NINV, VINV, EINV,
  IEC: NINV, VINV, LINV, EINV, RXIDG
  Thermal Flat, IT, I2T, I4T

TWO ELEMENTS UNBALANCED LOAD PROTECTION

- Supervision by definite time or tripping characteristic

RECORDERS

- Disturbance recorder: 120 s non volatile
- Fault recorder: 20 faults
- Event recorder: 300 events
- Trend recorder: 4000 non volatile entries

ADDITIONAL HIGHLIGHTS

- Inrush
- Thermal replica
- Four elements external protection
- Plausibility checks
- Adaptive parameter sets
- Status display
- Breaker Manager, Breaker wear

COMPREHENSIVE MEASURED VALUES AND STATISTICS

- THD (total harmonic distortion)
- Current phasors and angles
- RMS and fundamental
- Sequence currents
- Differential currents

TEMPERATURE PROTECTION

- Buchholz (sudden pressure), ext. oil temperature, and aux. temperature protection via digital input
- Temperature measurement via external RTD-box (option)

SUPERVISION

- Current transformer supervision
- Circuit breaker failure protection
- Trip circuit supervision
- Cold load pickup
- Switch onto fault

RECORDERS

- USB connection
- Customizable Display (Single-Line, ...)
- Customizable Inserts
- Copy and compare parameter sets
- Forcing and disarming of output relays
- Fault simulator
- Graphical display of tripping characteristics
- 8 languages selectable within the relay

COMMUNICATION OPTIONS

- IEC 61850, IEC 60870-5-103, Profinbus DP
- Modbus RTU and/or Modbus TCP
- IEC 60870-5-104
- DNP 3.0 (RTU, TCP, UDP)
- SCADApter for Retrofit

IT SECURITY

- Menu for the activation of BDEW-Whitepaper-compliant security settings
- Security Logger
- Self-monitoring; Syslog
- Encrypted connection with Smart view

CONTROL

- Two breakers (or isolators/grounding switches)
- Breaker wear

LOGIC

- Up to 80 logic equations for protection, control and monitoring

TIME SYNCHRONISATION

- SNTP,IRIG-B00X, Modbus,
  DNP 3.0, IEC60870-5-103

PC TOOLS

- Setting and analyzing software
  Smart view for free
- Including page editor to design own pages
**FUNCTIONAL OVERVIEW**

<table>
<thead>
<tr>
<th>Protective Functions</th>
<th>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer differential protection (2 windings), Id: Curve with zero point and three settable slopes and highset element (Id&gt;&gt;, Inrush stabilisation / detection of 2nd, 4th and 5th harmonics</td>
<td>1</td>
<td>87T</td>
</tr>
<tr>
<td>Restricted earth fault IdG, IdG&gt;&gt;, characteristics similar to 87T</td>
<td>2</td>
<td>87TN</td>
</tr>
<tr>
<td>I, time overcurrent and short circuit protection (non-directional) Multiple reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI)</td>
<td>4</td>
<td>50P, 51P</td>
</tr>
<tr>
<td>I2&gt;, unbalanced load protection with evaluation of the negative phase sequence currents</td>
<td>2</td>
<td>46</td>
</tr>
<tr>
<td>ThR, overload protection with thermal replica for transformers IEC60255-8, alarm and trip threshold</td>
<td>1</td>
<td>49T</td>
</tr>
<tr>
<td>TG, earth overcurrent and short circuit protection (non-directional) Tremendous reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI)</td>
<td>4</td>
<td>50N/G, 51N/G</td>
</tr>
<tr>
<td>Exp, External alarm and trip functions</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>RTD temperature supervision via optional RTD-Box with 12 sensors</td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control and Logic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Control: Position indication, supervision time management and interlockings for 2 breakers</td>
<td></td>
</tr>
<tr>
<td>Logic: Up to 80 logic equations, each with 4 inputs, selectable logical gates, timers and memory function</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supervision Functions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CBF, circuit breaker failure protection for both circuit breakers</td>
<td>2</td>
</tr>
<tr>
<td>TCS, trip circuit supervision</td>
<td>2</td>
</tr>
<tr>
<td>CTS, current transformer supervision</td>
<td>2</td>
</tr>
<tr>
<td>CLPU, cold load pickup</td>
<td>1</td>
</tr>
<tr>
<td>SOTF, switch onto fault</td>
<td>1</td>
</tr>
<tr>
<td>BW, breaker wear</td>
<td>2</td>
</tr>
<tr>
<td>Non volatile event recorder up to 120 s with 32 samples per cycles</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPROVALS</th>
<th>CONNECTIONS (EXAMPLE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>certified regarding UL508 (Industrial Controls)</td>
<td></td>
</tr>
<tr>
<td>certified regarding CSA-C22.2 No. 14 (Industrial Controls)</td>
<td></td>
</tr>
<tr>
<td>certified by EAC (Eurasian Conformity)</td>
<td></td>
</tr>
<tr>
<td>Type tested (and certified) regarding IEC60255-1</td>
<td></td>
</tr>
<tr>
<td>Lloyd’s Register Type Approval Certificate</td>
<td></td>
</tr>
<tr>
<td>(Declaration of identity)</td>
<td></td>
</tr>
<tr>
<td>Type Approval Certificate from CQC China</td>
<td></td>
</tr>
<tr>
<td>Complies with IEEE 1547-2003</td>
<td></td>
</tr>
<tr>
<td>Amended by IEEE 1547a-2014</td>
<td></td>
</tr>
<tr>
<td>Complies with ANSI C37.90-2005</td>
<td></td>
</tr>
</tbody>
</table>
FUNCTIONAL OVERVIEW IN ANSI FORM

Typical Configuration

Winding Side 1

Winding Side 2

W1 74TC
W1 50N/G
W1 51N/G
W1 87N
W1 Inrush
W1 50
W1 51
W1 46
W1 50BF
49
Switchgear Wear (2 elements)

W2 50N/G
W2 51N/G
W2 87N
W2 Inrush
W2 50
W2 51
W2 46
W2 50BF

MET (Metering, Statistics, Demand)

Current and Volt: unbalance, THD and THD, Fundamental RMS, Max/Min/Avg, phasors and angles

Power: RMS, P, Q, S, PF

Recorders:
SER (Event)
DDR (Disturbance)
DFR (Fault)
Statistic
Trend

RMS, P, Q, S, PF

W1 or W2 CLPU
W1 or W2 SOTF

87T

Option
Standard

RTD (ANSI 26/38/49): requires URTD box (separate hardware)
**Non-directional Transformer Differential Protection**

<table>
<thead>
<tr>
<th>Digital Inputs</th>
<th>Binary output relays</th>
<th>Housing</th>
<th>Large display</th>
<th>MRDT4 -2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>7</td>
<td>B2</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>16</td>
<td>13</td>
<td>B2</td>
<td></td>
<td>D</td>
</tr>
</tbody>
</table>

**Hardware variants**

- Phase Current 5 A/1 A, W1/W2 Ground Current 5 A/1 A: 0
- Phase Current 5 A/1 A, W1 Sen. Gr. Curr. 5 A/1 A, W2 Gr. Curr. 5 A/1 A: 1
- Phase Current 5 A/1 A, W1 Gr. Curr. 5 A/1 A, W2 Sen. Gr. Curr. 5 A/1 A: 2
- Phase Current 5 A/1 A, W1/W2 Sen. Gr. Curr. 5 A/1 A: 3

**Housing and mounting**
- Door mounting: A
- Door mounting 19" (flush mounting): B

**Communication protocol**

- Without protocol: A
- Modbus RTU, IEC60870-5-103, DIN3.0 RTU | RS485/terminals: B*
- Modbus TCP, DIN3.0 TCP/UDP, IEC 60870-5-104 | Ethernet 100 MB/RJ45: C*
- Profibus-DP | optic fiber/ST-connector: D*
- Profibus-DP | RS485/D-SUB: E*
- Modbus RTU, IEC60870-5-103, DIN3.0 RTU | optic fiber/ST-connector: F*
- Modbus RTU, IEC60870-5-103, DIN3.0 RTU | RS485/D-SUB: G*
- IEC61850, Modbus TCP, DIN3.0 TCP/UDP, IEC 60870-5-104 | Ethernet 100MB/RJ45: H*
- IEC61850, Modbus TCP, DIN3.0 TCP/UDP, IEC 60870-5-104 | Ethernet 100MB/RJ45: I*
- Modbus TCP, DIN3.0 TCP/UDP, IEC 60870-5-104 | Optical Ethernet 100MB/LC duplex connector: K*
- Modbus TCP, DIN3.0 TCP/UDP, IEC 60870-5-104 | Optical Ethernet 100MB/LC duplex connector: L*
- IEC61850, Modbus TCP, DIN3.0 TCP/UDP, IEC 60870-5-104 | Ethernet 100 MB/RJ45: T*

**Harsh Environment Option**

- None: A
- Conformal Coating: B

**Available menu languages (in every device)**

- English / German / Spanish / Russian / Polish / Portuguese / French / Romanian

*Within every communication option only one communication protocol is usable.

Smart view can be used in parallel via the Ethernet interface (RJ45).

The parameterizing- and disturbance analyzing software Smart view is included in the delivery of HighPROTEC devices.

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**Current inputs**

- 8 (1 A and 5 A) with automatic CT Disconnect

**Digital Inputs**

- Switching thresholds adjustable via software

**Power supply**

- Wide range power supply
- $24 \, V_{dc} - 270 \, V_{dc} / 48 \, V_{dc} - 230 \, V_{ac} (-20/+10\%)

**Terminals**

- All terminals plug type

**Type of enclosure**

- IP54

**Dimensions of housing**

- 19" flush mounting: 212.7 mm x 173 mm x 208 mm
- Door mounting: 212.7 mm x 183 mm x 208 mm
- 8.374 in. x 6.811 in. x 8.189 in.

**Weight (max. components)**

- approx. 4 kg